

What Is Claimed Is:

1. A filter device comprising:
  - a) a housing;
  - b) a first fluid flow path comprising a hollow fiber bundle contained in the housing;
  - c) a second fluid flow path located between the housing and the first fluid flow path;
  - d) a fluid chamber in fluid communication with the first fluid flow path;
  - e) a curved channel in fluid communication with the fluid chamber and a first fluid flow path port.
2. The device of claim 1, wherein the curved channel is selected from the group consisting of circular and semicircular channels.
3. The device of claim 1, wherein the curved channel is arranged approximately in the center of the hollow fiber bundle.
4. The device of claim 1, wherein the first fluid flow path port is an inlet and fluid flows into the inlet, through the curved channel, into the fluid chamber, and into the first fluid flow path.
5. The device of claim 4, wherein cross-sectional area of the curved channel decreases in the direction of fluid flow.
6. The device of claim 4, wherein the cross-sectional area of the curved channel decreases linearly in the direction of fluid flow.

7. The device of claim 4, wherein the height of the curved channel decreases in the direction of fluid flow.
8. The device of claim 4, wherein the width decreases of the curved channel in the direction of fluid flow.
9. The device of claim 2, wherein the outside diameter of the curved channel is smaller than the outside diameter of the hollow fiber bundle.
10. The device of claim 4, wherein fluid flows from the curved channel to the fluid chamber with approximately uniform radial symmetry.
11. The device of claim 1, wherein the ends of the hollow fibers are held in a casting compound extending approximately parallel to the curved channel.
12. The device of claim 1, wherein the fluid port extends radially from the curved channel.
13. The device of claim 1, wherein the diameter of the curved channel is about 2 to about 4 times larger than the diameter of the fluid port.
14. The device of claim 1, wherein the diameter of the channel is about 2.5 to about 3.5 times larger than the diameter of the port.
15. The device of claim 1, wherein the diameter of the channel is less than about  $9/16$  the diameter of the hollow fiber bundle.

16. The device of claim 1, wherein the diameter of the channel is about  $\frac{3}{8}$  the diameter of the hollow fiber bundle.
17. The device of claim 1, wherein the curved channel includes guide elements constructed and arranged to influence the direction of fluid flow leaving the channel.
18. The device of claim 17, wherein the guide elements are curved ribs.
19. The device of claim 18, wherein the curved ribs are equidistant from one another circumferentially.
20. The device of claim 11, wherein the hollow fiber bundles extend over substantially over the entire cross-sectional area of the casting material.
21. The device of claim 11, wherein the hollow fiber bundles extend over only a portion of the cross-sectional area of the casting material.
22. The device of claim 1, further comprising a second fluid flow path port in fluid communication with the second fluid flow path.
23. The device of claim 22, wherein the first fluid flow path port, the second fluid flow path port, the curved channel, and the fluid chamber are provided in an end cap.
24. The device of claim 23, wherein the end cap can be connected to the housing in a fluid-tight manner.
25. The device of claim 23, wherein the first fluid flow path

port and the second fluid flow path port are arranged radially on the end cap.

26. The device of claim 23, wherein the center lines of the first fluid flow path port and the second fluid flow path port are parallel to one another.

27. The device of claim 23, wherein the plane of the mouth of the first fluid flow path port and the plane of the mouth of the second fluid flow path port are parallel.

28. The device of claim 23, wherein the mouth of the first fluid flow path port and the mouth of the second fluid flow path port lie in one plane.

29. The device of claim 23, wherein the end cap is a plastic material manufactured by injection molding.

30. The device of claim 23, wherein an end cap is provided at each end of the housing.

31. A filter device comprising:

- a) a substantially cylindrical housing;
- b) a first fluid flow path comprising a hollow fiber bundle contained in the housing;
- c) a second fluid flow path located between the housing and the first fluid flow path;
- d) an end cap comprising:
  - i) a first fluid flow path port;
  - ii) a fluid chamber in fluid communication with the first fluid flow path; and
  - iii) a curved channel in fluid communication with the fluid chamber and the first fluid

flow path port;  
wherein fluid flows into the first fluid flow path port,  
into and through the curved channel, into the fluid  
chamber, and into the first fluid flow path.

32. The device of claim 31, wherein the curved channel is  
selected from the group consisting of circular and  
semicircular channels.

33. The device of claim 31, wherein fluid flows from the  
curved channel into the fluid chamber with approximately  
uniform radial symmetry.

34. The device of claim 31, wherein an end cap is provided at  
each end of the housing.

35. An end cap for a filter device comprising:

- a) a fluid port;
- b) a curved channel in fluid communication with  
the fluid port; and
- c) a fluid chamber in fluid communication with the  
curved channel;

wherein the end cap may be connected in fluid tight  
fashion to a housing containing a fluid flow path  
comprising a hollow fiber bundle such that fluid flows in  
the port, into and through the curved channel, into the  
fluid chamber, and into the fluid flow path.

36. The end cap of claim 35, wherein the curved channel is  
selected from the group consisting of circular and  
semicircular channels.

37. The end cap of claim 35, wherein the cross-sectional area

of the curved channel decreases in the direction of fluid flow.

38. The end cap of claim 4, wherein the cross-sectional area of the curved channel decreases linearly in the direction of fluid flow.

39. The end cap of claim 35, wherein the outside diameter of the curved channel is smaller than the outside diameter of the hollow fiber bundle.

40. The end cap of claim 35, wherein fluid flows from the curved channel to the fluid chamber with approximately uniform radial symmetry.

41. The end cap of claim 35, wherein the fluid port extends radially from the curved channel.

42. The end cap of claim 35, wherein the diameter of the curved channel is about 2 to about 4 times larger than the diameter of the fluid port.

43. The end cap of claim 35, wherein the diameter of the channel is about 2.5 to about 3.5 times larger than the diameter of the port.

44. The end cap of claim 35, wherein the curved channel includes guide elements constructed and arranged to influence the direction of fluid flow leaving the channel.

45. The end cap of claim 32, wherein the guide elements are curved ribs.

46. The end cap of claim 41, wherein the curved ribs are equidistant from one another circumferentially.

47. The end cap of claim 31, further comprising a second fluid port and wherein the fluid port and the second fluid outlet port are arranged radially on the end cap.

48. The end cap of claim 31, wherein the center lines of the fluid port and the second fluid port are parallel to one another.

49. The end cap of claim 31, wherein the plane of the mouth of the fluid port and the plane of the mouth of the second fluid port are parallel.

50. The end cap of claim 31, wherein the mouth of the fluid port and the mouth of the second fluid port lie in one plane.

51. The end cap of claim 31, wherein the cap is a plastic material manufactured by injection molding.

52. A method of filtering blood comprising the steps of:

- a) providing blood to a first fluid flow path of a filter device comprising:
  - i) a housing;
  - ii) the first fluid flow path comprising a hollow fiber bundle contained in the housing;
  - iii) a second fluid flow path located between the housing and the first fluid flow path;
  - iv) a fluid chamber in fluid communication with the first fluid flow path; and
  - v) a curved channel in fluid communication with the fluid chamber and a first fluid flow path

port;

b) flowing the blood into the first fluid flow path port, into and through the curved channel, into the fluid chamber with approximately uniform radial symmetry, and into the hollow fiber bundle; and

5 c) flowing dialysis fluid through the second fluid flow path.

53. The method of claim 52, wherein there is substantially uniform flow of blood into the hollow fiber bundle provides  
10 substantially uniform utilization of the hollow fiber bundle.

54. A method of filtering blood comprising the steps of:

a) providing blood to a first fluid flow path of a filter device comprising:

15 i) a housing;  
ii) the first fluid flow path comprising a hollow fiber bundle contained in the housing;  
iii) a second fluid flow path located between the housing and the first fluid flow path;  
20 iv) a fluid chamber in fluid communication with the first fluid flow path; and  
v) a curved channel in fluid communication with the fluid chamber and a first fluid flow path port;

25 b) flowing the blood into the first fluid flow path port, into and through the curved channel, into the fluid chamber with approximately uniform radial symmetry, and into the hollow fiber bundle; and

wherein ultrafiltrate from the blood flows into the  
30 second fluid flow path.